

J-3636A

WE CLAIM:

1. An aerosol dispenser assembly comprising:
a container holding a liquid product and a liquefied gas propellant for propelling the liquid product from said container, the propellant being present in a quantity of at most about 25% by weight of the contents of said container; and
a valve attached to said container for selectively dispensing the liquid product from said container as a mist,
said assembly having a Clark/Valpey (CV) value of at most about 25, where $CV = 2.5(D-32) + 10|Q-1.1| + 2.6R$,
D being the average diameter in micrometers of particles dispensed during the first forty seconds of spray of said assembly, Q being the average spray rate in grams/second during the first forty seconds of spray of said assembly, and R being the amount of the product remaining in said container at the end of the life of said assembly expressed as a percentage of the initial fill weight.
2. An aerosol dispenser assembly according to claim 1, the propellant being present in a quantity of between about 10% and about 25% by weight of the contents of said container.
3. An aerosol dispenser assembly according to claim 1, wherein D is in the range of about 25 to about 40 micrometers.
4. An aerosol dispenser assembly according to claim 1, wherein D is in the range of about 30 to about 35 micrometers.

I-3636A

5. An aerosol dispenser assembly according to claim 1, wherein Q is in the range of about 0.7 to about 1.4 grams/second.
6. An aerosol dispenser assembly according to claim 1, wherein Q is in the range of about 1.0 to about 1.3 grams/second.
7. An aerosol dispenser assembly according to claim 1, wherein R is at most about 2.0% of the initial fill weight.
8. An aerosol dispenser assembly according to claim 1, wherein R is at most about 1.0% of the initial fill weight.
9. An aerosol dispenser assembly according to claim 1, wherein the propellant is present in a quantity of between about 10% and about 25% by weight of the contents of said container, and wherein D is in the range of about 30 to about 35 micrometers, Q is in the range of about 1.0 to about 1.3 grams/second, and R is at most about 1.0% of the initial fill weight.
10. An aerosol dispenser assembly according to claim 1, wherein the liquid product and the propellant form an oil-out emulsion when shaken.
11. An aerosol dispenser assembly according to claim 10, wherein the propellant is a hydrocarbon propellant.

J-3636A

12. An aerosol dispenser assembly according to claim 11, wherein the propellant is free of normal butane.

13. An aerosol dispenser assembly according to claim 1, wherein the contents of said container are pressurized to an initial can pressure of between about 55 psig and about 120 psig.

14. An aerosol dispenser assembly according to claim 1, wherein the contents of said container are pressurized to an initial can pressure of between about 55 psig and about 80 psig.

15. An aerosol dispenser assembly according to claim 1, wherein the contents of said container are pressurized to an initial can pressure of between about 70 psig and about 80 psig.

16. An aerosol dispenser assembly according to claim 1, said valve comprising a valve body and a valve stem, said valve body having a body orifice having a diameter of between about 0.254 and about 0.635 millimeters, for flow of the liquid product and propellant during dispensing.

17. An aerosol dispenser assembly according to claim 16, said valve body further having a vapor tap having a diameter of between about 0.076 and about 0.254 millimeters, for introducing additional propellant gas through said valve body in order to facilitate mixing of the propellant and the liquid product prior to dispensing.

J-3636A

18. An aerosol dispenser assembly according to claim 17, said valve stem defining at least one stem orifice having a total area of at least 0.405 square millimeters, for flow of the liquid product and propellant during dispensing.

19. An aerosol dispenser assembly according to claim 18, further comprising a dispenser cap coupled to said valve stem for actuating said valve to dispense the liquid product and propellant, said dispenser cap defining an exit orifice having a diameter of between about 0.330 and about 0.635 millimeters, through which the liquid product and the propellant are dispensed.

20. An aerosol dispenser assembly according to claim 19, further comprising a dip tube coupled to the underside of said valve body and extending toward the bottom of said container, said dip tube having an inner diameter of between about 1.016 and about 3.099 millimeters.

21. An aerosol dispenser assembly according to claim 20, the propellant being present in a quantity of at most about 15% by weight of the contents of said container.

22. An aerosol dispenser assembly according to claim 20, the propellant being present in a quantity of between about 10% and about 15% by weight of the contents of said container.

23. An aerosol dispenser assembly according to claim 1, said valve comprising a valve body and a valve stem, said valve body having a body orifice having a diameter of between about 1.270 and about 1.575 millimeters, for flow of the liquid product and propellant during dispensing.

24. An aerosol dispenser assembly according to claim 23, said valve body further having a vapor tap having a diameter of between about 0.254 and about 0.483 millimeters, for introducing additional propellant gas through said valve body in order to facilitate mixing of the propellant and the liquid product prior to dispensing.

25. An aerosol dispenser assembly according to claim 24, said valve stem defining at least one stem orifice having a total area of at least about 0.203 square millimeters, for flow of the liquid product and propellant during dispensing.

26. An aerosol dispenser assembly according to claim 25, further comprising a dispenser cap coupled to said valve stem for actuating said valve to dispense the liquid product and propellant, said dispenser cap defining an exit orifice having a diameter of between about 0.330 and about 0.635 millimeters, through which the liquid product and the propellant are dispensed.

27. An aerosol dispenser assembly according to claim 26, further comprising a dip tube coupled to the underside of said valve body and extending toward the bottom of said container, said dip tube having an inner diameter of between about 1.016 and about 1.524 millimeters.

J-3636A

28. An aerosol dispenser assembly comprising:

a container holding a liquid product and a liquefied gas propellant for propelling the liquid product from said container, the propellant being present in a quantity of at most about 25% by weight of the contents of said container;

a valve attached to said container for selectively dispensing the liquid product and the propellant from said container, said valve comprising:

(a) a valve body having (i) a body orifice having a diameter of between about 1.270 and about 1.575 millimeters, for flow of the liquid product and the propellant during dispensing, and (ii) a vapor tap having a diameter of between about 0.254 and about 0.483 millimeters, for introducing additional propellant gas through said valve body in order to facilitate mixing of the propellant and the liquid product prior to dispensing; and

(b) a valve stem disposed in said valve and defining at least one stem orifice having a total area of at least about 0.203 square millimeters, for flow of the liquid product and the propellant during dispensing; and

a dispenser cap coupled to said valve stem for actuating said valve to dispense the liquid product, said dispenser cap defining an exit orifice having a diameter of between about 0.330 and about 0.635 millimeters, through which the liquid product and the propellant are dispensed.

29. An aerosol dispenser assembly according to claim 28, said body orifice having a diameter of about 1.270 millimeters.

30. An aerosol dispenser assembly according to claim 28, said vapor tap having a diameter of between about 0.330 and about 0.457 millimeters.

J-3636A

31. An aerosol dispenser assembly according to claim 28, said vapor tap having a diameter of about 0.406 millimeters.

32. An aerosol dispenser assembly according to claim 28, said at least one stem orifice having a total area of at least about 0.405 square millimeters.

33. An aerosol dispenser assembly according to claim 28, said exit orifice having a diameter of between about 0.381 and about 0.559 millimeters.

34. An aerosol dispenser assembly according to claim 28, said exit orifice having a diameter of about 0.508 millimeters.

35. An aerosol dispenser assembly according to claim 28, further comprising a dip tube coupled to the underside of said valve body and extending toward the bottom of said container, said dip tube having an inner diameter of between about 1.016 and about 1.524 millimeters.

36. An aerosol dispenser assembly according to claim 35, said dip tube having a diameter of about 1.524 millimeters.

J-3636A

37. An aerosol dispenser assembly comprising:

a container holding a liquid product and a liquefied gas propellant for propelling the liquid product from said container, the propellant being present in a quantity of at most about 25% by weight of the contents of said container; and

a valve attached to said container for selectively dispensing the liquid product and the propellant from said container, said valve comprising:

(a) a valve body having i) a body orifice having a diameter of between about 0.254 and about 0.635 millimeters, for flow of the liquid product and the propellant during dispensing, and ii) a vapor tap having a diameter of between about 0.076 and about 0.254 millimeters, for introducing additional propellant gas through said valve body in order to facilitate mixing of the propellant and the liquid product prior to dispensing; and

(b) a valve stem disposed in said valve and defining at least one stem orifice having a total area of at least 0.405 square millimeters, for flow of the liquid product and the propellant during dispensing; and

a dispenser cap coupled to said valve stem for actuating said valve to dispense the liquid product, said dispenser cap defining an exit orifice having a diameter of between about 0.330 and about 0.635 millimeters, through which the liquid product and the propellant are dispensed.

38. An aerosol dispenser assembly according to claim 37, said body orifice having a diameter of between about 0.330 and about 0.381 millimeters.

39. An aerosol dispenser assembly according to claim 37, said body orifice having a diameter of about 0.330 millimeters.

J-3636A

40. An aerosol dispenser assembly according to claim 37, said vapor tap having a diameter of between about 0.127 and about 0.203 millimeters.
41. An aerosol dispenser assembly according to claim 37, said vapor tap having a diameter of about 0.127 millimeters.
42. An aerosol dispenser assembly according to claim 37, said at least one stem orifice having a total area of at least about 0.584 square millimeters.
43. An aerosol dispenser assembly according to claim 37, said at least one stem orifice having a total area of at least about 1.824 square millimeters.
44. An aerosol dispenser assembly according to claim 37, said exit orifice having a diameter of between about 0.381 and about 0.559 millimeters.
45. An aerosol dispenser assembly according to claim 37, said exit orifice having a diameter of about 0.457 millimeters.
46. An aerosol dispenser assembly according to claim 37, further comprising a dip tube coupled to the underside of said valve body and extending toward the bottom of said container, said dip tube having an inner diameter of between about 1.016 and about 3.099 millimeters.

J-3636A

47. An aerosol dispenser assembly according to claim 46, said dip tube having a diameter of between about 1.270 and about 2.286 millimeters.

48. An aerosol dispenser assembly according to claim 46, said dip tube having a diameter of about 1.524 millimeters.

49. An aerosol dispenser assembly according to claim 37, the propellant being present in a quantity of at most about 15% by weight of the contents of said container.

50. An aerosol dispenser assembly according to claim 37, the propellant being present in a quantity of between about 10% and about 25% by weight of the contents of said container.

51. An aerosol dispenser assembly according to claim 50, said body orifice having a diameter of between about 0.330 and about 0.381 millimeters, said vapor tap having a diameter of between about 0.127 and about 0.203 millimeters, said at least one stem orifice having a total area of at least about 0.584 square millimeters, and said exit orifice having a diameter of between about 0.381 and about 0.559 millimeters.

52. An aerosol dispenser assembly according to claim 51, the propellant being present in a quantity of between about 10% and about 15% by weight of the contents of said container.

J-3636A

53. An aerosol dispenser assembly comprising:

a container holding a liquid product and a liquefied gas propellant for propelling the liquid product from said container, the propellant being present in a quantity of at most about 15% by weight of the contents of said container; and

a valve attached to said container, said valve being capable of selectively dispensing the liquid product and the propellant from said container as a mist having a particle size in the range of about 15 micrometers to about 60 micrometers at a rate of between about 0.6 and about 1.8 grams/second, at least during the first 10 seconds of spraying time of the life of said assembly.

54. An aerosol dispenser assembly comprising:

a container that contains a liquid product and a propellant for propelling the liquid product from said container, wherein the propellant is a liquefied gas propellant and is present in an amount of at most about 25% by weight of the contents of said container; and

a valve attached to said container for selectively dispensing the liquid product from said container as a mist, wherein the dispensed mist has an average particle size of less than about 35 micrometers, over at least about 75% of the life of said dispenser assembly.

55. An aerosol dispenser assembly according to claim 54, wherein the propellant is a hydrocarbon propellant.

56. An aerosol dispenser assembly according to claim 55, wherein the propellant is free of normal butane.

J-3636A

57. An aerosol dispenser assembly according to claim 54, wherein the contents of said container are pressurized to between about 55 psig and about 120 psig.

58. An aerosol dispenser assembly according to claim 54, wherein the contents of said container are pressurized to between about 55 psig and about 80 psig.

59. An aerosol dispenser assembly according to claim 54, wherein the contents of said container are pressurized to between about 70 psig and about 80 psig.

60. An aerosol dispenser assembly according to claim 54, further comprising a vapor tap formed in said valve to facilitate thorough mixing of the propellant and the liquid product prior to dispensing, and a valve stem disposed in said valve and defining at least one stem orifice for flow of the product during dispensing.

61. An aerosol dispenser assembly according to claim 60, wherein said vapor tap has a diameter of about 0.330 to about 0.483 millimeters.

62. An aerosol dispenser assembly according to claim 60, wherein said valve stem defines a pair of stem orifices.

J-3636A

63. An aerosol dispenser assembly according to claim 60, further comprising:
a dispenser cap mounted on said valve stem for actuating said valve to dispense the liquid product, said dispenser cap defining an exit path for the liquid product to be dispensed;
and

a breakup bar positioned in the exit path of said dispenser cap to break up the liquid product in order to reduce the size of the particles before the liquid product is dispensed.

64. An aerosol dispenser assembly comprising:
a container for containing a liquid product and a propellant for propelling the liquid product from said container, wherein the propellant is a liquefied gas propellant and is present in an amount of at most about 25% by weight of the contents of said container; and

a valve attached to said container for selectively dispensing the liquid product from said container, wherein said dispenser assembly is capable of dispensing over about 98% by weight of the liquid product from said container.

65. An aerosol dispenser assembly according to claim 64, wherein the propellant is a hydrocarbon propellant.

66. An aerosol dispenser assembly according to claim 65, wherein the propellant is free from normal butane.

67. An aerosol dispenser assembly according to claim 64, wherein the contents of said container are pressurized to between about 55 psig and about 120 psig.

J-3636A

68. An aerosol dispenser assembly according to claim 64, wherein the contents of said container are pressurized to between about 55 psig and about 80 psig.

69. An aerosol dispenser assembly according to claim 64, wherein the contents of said container are pressurized to between about 70 psig and about 80 psig.

70. An aerosol dispenser assembly according to claim 64, further comprising a vapor tap formed in said valve to facilitate thorough mixing of the propellant and the liquid product prior to dispensing, and a valve stem disposed in said valve and defining at least one stem orifice for flow of the product during dispensing.

71. An aerosol dispenser assembly according to claim 70, wherein said vapor tap has a diameter of about 0.330 to about 0.483 millimeters.

72. An aerosol dispenser assembly according to claim 70, wherein said valve stem defines a pair of stem orifices.

73. An aerosol dispenser assembly according to claim 70, further comprising:
a dispenser cap mounted on said valve stem for actuating said valve to dispense the liquid product, said dispenser cap defining an exit path for the liquid product to be dispensed;
and

a breakup bar positioned in the exit path of said dispenser cap to break up the liquid product in order to reduce the size of the particles before the liquid product is dispensed.

J-3636A

74. An aerosol dispenser assembly comprising:

a container that contains a liquid product and a propellant for propelling the liquid product from said container, wherein the propellant is a liquefied gas propellant and is present in an amount of at most about 25% by weight of the contents of said container; and

a valve attached to said container for selectively dispensing the liquid product from said container as a mist, wherein the mist is dispensed at a rate of between about 0.6 to about 1.8 grams/second, over at least about 75% of the life of said dispenser assembly.

75. An aerosol dispenser assembly according to claim 74, wherein the mist is dispensed at a rate of between about 0.7 to about 1.4 grams/second, over at least about 75% of the life of said dispenser assembly.

76. An aerosol dispenser assembly according to claim 74, wherein the mist is dispensed at a rate of between about 0.9 to about 1.3 grams/second, over at least about 75% of the life of said dispenser assembly.

77. An aerosol dispenser assembly according to claim 74, further comprising a vapor tap formed in said valve to facilitate thorough mixing of the propellant and the liquid product prior to dispensing, and a valve stem disposed in said valve and defining at least one stem orifice for flow of the product during dispensing.

78. An aerosol dispenser assembly according to claim 74, further comprising a vapor tap formed in said valve to facilitate thorough mixing of the propellant and the liquid product prior to dispensing, and a valve stem disposed in said valve and defining at least one stem orifice for flow of the product during dispensing.

J-3636A

79. An aerosol dispenser assembly according to claim 74, wherein said vapor tap has a diameter of about 0.330 to about 0.483 millimeters.

80. An aerosol dispenser assembly comprising:

a container that contains a liquid product and a propellant for propelling the liquid product from said container, wherein the propellant is a liquefied gas hydrocarbon propellant, is free of normal butane, and is present in an amount of at most about 25% by weight of the contents of said container, and wherein the contents of said container are pressurized to between about 55 psig and about 80 psig;

a valve attached to said container for selectively dispensing the liquid product from said container as a mist, wherein the dispensed mist has an average particle size of less than about 35 micrometers, over at least about 75% of the life of said dispenser assembly, and wherein said dispenser assembly is capable of dispensing over about 98% by weight of the liquid product from said container;

a vapor tap formed in said valve to facilitate thorough mixing of the propellant and the liquid product prior to dispensing, said vapor tap having a diameter of about 0.330 to about 0.483 millimeters;

a valve stem disposed in said valve and defining at least one stem orifice for flow of the product during dispensing;

a dispenser cap mounted on said valve stem for actuating said valve to dispense the liquid product, said dispenser cap defining an exit path for the liquid product to be dispensed; and

a breakup bar positioned in the exit path of said dispenser cap to break up the liquid product in order to reduce the size of the particles before the liquid product is dispensed.